

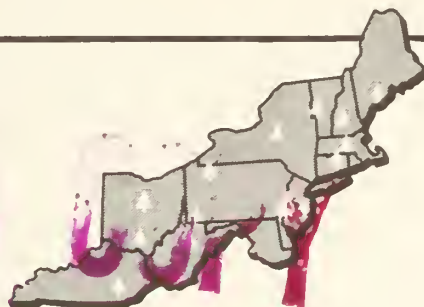
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RED OAK BORERS BECOME STERILE WHEN REARED UNDER CONTINUOUS LIGHT

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Abstract.—Red oak borers, *Enaphalodes rufulus* (Haldeman), reared under continuous light for 12 weeks became sterile. Sterility is thought to have been caused by light destroying vitamins essential for fertility.

Photoperiod influences diapause in many species of insects. However, continuous light can adversely affect the physiology of some insects.

Lum and Flaherty (1970) reported that *Plodia interpunctella* (Hubner) females mated with males reared under continuous light laid fewer eggs than females mated with males reared under alternating light and dark conditions. Poor quality of spermatozoa from males reared under continuous light was believed to be the reason for the difference.

When artificially reared, the red oak borer, *Enaphalodes rufulus* (Haldeman), diapaused in the last instar. During testing to see if photoperiod affected diapause, I found that

continuous light had deleterious effects on the larvae and ensuing adults.

Materials and Methods

The artificial medium used in this study was the medium B that I reported earlier (Galford 1969). The larvae were reared in 1/2-oz. round aluminum cups sandwiched between sheets of plate glass taped together. Borer eggs were obtained from field-collected adults.

Forty larvae were reared for 4 weeks in the dark and then divided into two equal groups. One group was placed under a bank of four 40-watt Plant Gro fluorescent lights suspended 0.6 m above the rearing contain-

ers. The other group was placed in a cardboard box under the lights, and the box was sealed and covered with a thick black cloth.

The larvae were transferred into cups with fresh artificial medium at weekly intervals for 12 weeks. Then all the larvae in their rearing cups were packed in a cardboard box, and the box was sealed and put in a refrigerator set at 4° C. The larvae were removed after 50 days and returned to the test conditions. The adults that emerged were paired, and records were kept of fecundity and fertility.

Results and Discussion

Of the larvae reared under continuous light, one died during the rearing period, two developed abnormally long legs and died in the refrigerator, one "normal" larva died in the refrigerator, and two adults emerged with malformed antennae and elytra. The remaining adults looked normal. Eight females laid 467 eggs, none of which hatched.

Of the larvae reared in the dark, one died during the rearing period, one died in the refrigerator, and one adult had malformed antennae. Ten females laid 1,128 eggs, of which 81 percent hatched.

All the larvae in both groups went into diapause, so the test photoperiod did not inhibit diapause.

The most significant result of the test was the complete sterility of adults from larvae reared under continuous light for 12 weeks. No tests were made to determine if one or both sexes were sterile, because the tests were completed before it was known that the beetles were sterile.

The cause of adult sterility was not determined, but it may have been due to a nutritional deficiency. Certain vitamins, such as riboflavin (a nutritional requirement for red oak borers), are readily destroyed upon exposure to light; and some of the light-labile vitamins are essential for most insects' fertility. In later studies, I found that, when red oak borer larvae developed long abnormal legs, it was related to a nutritional deficiency that caused the larvae to have an extra instar. Two of the larvae reared under continuous light developed long abnormal legs.

Literature Cited

- Galford, Jimmy R.
1969. ARTIFICIAL REARING OF 10 SPECIES OF WOOD-BORING INSECTS. USDA For. Serv. Res. Note NE-102. 6 p. NE. For. Exp. Stn., Upper Darby, Pa.
- Lum, P. T. M., and B. R. Flaherty.
1970. EFFECT OF CONTINUOUS LIGHT ON THE POTENCY OF *Plodia interpunctella* MALES (LEPIDOPTERA: PHYCITIDAE). Ann. Entomol. Soc. Am. 63:1470-1471.